IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Zhibo Zhao et al.	EXAMINER: Nguyen, Dinh Q.
SERIAL NO.:	10/646,551	GROUP ART UNIT: 3752
FILED:	August 21, 2003	ATTY DOCK. NO.: DP-308065
FOR:	COAXIAL LOW PRESSURE INJECTION METHOD AND A GAS COLLIMATOR FOR A KINETIC SPRAY NOZZLE	

APPEAL BRIEF

Mail Stop Appeal Brief - Patent
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicant submits the following Appeal Brief concurrently with a Notice of Appeal and in response to the Final Rejection set forth in the Final Office Action, dated July 26, 2006. The Commissioner is authorized to charge Deposit Account No. 08-2789 in the name of Howard & Howard Attorneys, P.C. the amount of $500.00 to cover the required fee for submitting this Appeal Brief. The Commissioner is authorized to charge any additional fees or credit any overpayment to Deposit Account No. 08-2789 for this matter.

(1) Real Party in Interest

The real party in interest is Delphi Technologies, Inc, assignee of the patent application in issue, as evidenced by an assignment recorded at Reel/Frame 014429/0989.

(2) Related Appeals and Interferences

NONE

(3) Status of Claims

Claims 1-20 remain in the application with claims 17-20 being withdrawn from consideration. Claims 1-16 stand as originally presented in the application with claims 1 and 5 thereof being in independent form. Claims 1-16 stand rejected and currently are on appeal.

(4) Status of Amendments

All amendments have been entered and are reflected in the claims in the Claims Appendix.

(5) Summary of Claimed Subject Matter

Claims 1-16 are on appeal with claims 1 and 5 being in independent form. Independent claim 1 is directed to a gas collimator for a kinetic spray nozzle that is useful in providing higher deposition efficiencies than previous gas collimators used in kinetic spray nozzles. The gas collimator of claim 1 has a central hole surrounded by a plurality of gas flow holes. The collimator also has a length of from 10 to 30 millimeters and the gas flow holes have a hydraulic diameter of from 0.5 to 5.0 millimeters. The specific limitations of independent claim 1 and the support for each in the specification and drawings are provided below in TABLE 1.

TABLE 1

Limitations	Support
A gas collimator for a kinetic spray nozzle comprising: a collimator having a central hole surrounded by a plurality of gas flow holes and a length of from 10 to 30 millimeters;	See FIGS. 4, 5, and 8B, and page 9, paragraph [0031], "the collimator 40' has a length of from 10 to 30 millimeters…has a central hole 114…surrounded by a plurality of gas flow holes 116.
said gas flow holes having a hydraulic diameter of from 0.5 to 5.0 millimeters.	See FIG. 8B, and page 9, paragraph [0031], "It is preferable that the hydraulic diameter for an individual hole 116 be from 0.5 to 5.0 millimeters."

Independent claim 5 is directed to a kinetic spray nozzle comprising a supersonic nozzle having a gas collimator located between a premix chamber and a mixing chamber. The mixing chamber is located adjacent to a converging section of the nozzle and a throat is located between the converging section and a diverging section of the nozzle. Like independent claim 1, independent claim 5 also recites that the collimator has a central hole surrounded by a plurality of gas flow holes and a length of from 10 to 30 millimeters. Independent claim 5 also recites that the gas flow holes have a hydraulic diameter of from 0.5 to 5.0 millimeters. The specific limitations of independent claim 5 and the support for each in the specification and drawings are provided below in TABLE 2.

TABLE 2

Limitations	Support
A kinetic spray nozzle comprising: a supersonic nozzle having a gas collimator located between a premix chamber and a mixing chamber; said mixing chamber located adjacent to a converging section of said nozzle; a throat located between said converging section and a diverging section of said nozzle;	See FIGS. 4 and 5, and page 7, paragraph [0025], "Passage 36 connects with a premix chamber 38 that directs air through a gas collimator [40'] and into a [mixing] chamber 42." See also paragraph [0026], "Chamber 42 is in communication with a de Laval type supersonic nozzle 54. The nozzle 54 has…an entrance cone 56 that decreases in diameter to a throat 58" to form a converging region." "Downstream of the throat is….a diverging region."
said collimator having a central hole surrounded by a plurality of gas flow holes and a length of from 10 to 30 millimeters;	See FIGS. 4, 5, and 8B, and page 9, paragraph [0031], "the collimator 40' has a length of from 10 to 30 millimeters…has a central hole 114…surrounded by a plurality of gas flow holes 116.
said gas flow holes having a hydraulic diameter of from 0.5 to 5.0 millimeters.	See FIG. 8B, and page 9, paragraph [0031], "It is preferable that the hydraulic diameter for an individual hole 116 be from 0.5 to 5.0 millimeters."

(6) Grounds of Rejection to be Reviewed on Appeal

A. Claims 1-3 and 5-10

Claims 1-3 and 5-10 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Van Steenkiste et al. (U.S. Patent No. 6,139,913) or Popoola et al. (U.S. Patent No. 6,464,933) in view of Roberts et al. (U.S. Patent No. 3,645,298).

B. Claims 1-3 and 5-10

Claims 1-3 and 5-10 also stand rejected under 35 U.S.C. §103(a) as being unpatentable over Van Steenkiste et al. (U.S. Patent No. 6,139,913) or Popoola et al. (U.S. Patent No. 6,464,933).

C. Claim 4

Claim 4 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Van Steenkiste et al. (U.S. Patent No. 6,139,913) or Popoola et al. (U.S. Patent No. 6,464,933) or in view of Roberts et al. (U.S. Patent No. 3,645,298) and further in view of Mochida et al. (U.S. Patent No. 4,740,408).

D. Claims 11-16

Claims 11-16 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Van Steenkiste et al. (U.S. Patent No. 6,139,913) or Popoola et al. (U.S. Patent No. 6,464,933) or in view of Roberts et al. (U.S. Patent No. 3,645,298) and further in view of Belashchenko (U.S. Patent No. 5,932,293).

(7) Argument

A. Claims 1-3 and 5-10

Claims 1-3 and 5-10 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Van Steenkiste et al. (U.S. Patent No. 6,139,913) or Popoola et al. (U.S. Patent No. 6,464,933) in view of Roberts et al. (U.S. Patent No. 3,645,298). Applicants respectfully submit that the Examiner has not appropriately established the requisite *prima facie* case of obviousness.[1]

[1] The legal concept of *prima facie* obviousness allocates who has the burden of going forward with production of evidence. The Examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the Examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the reference itself or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. See MPEP 2143. The teaching or suggestion to make the combination and the reasonable expectation of success must both be found in the prior art and not based on Applicants' disclosure.[2] *All three of these criteria must be satisfied.*

Applicants respectfully assert that the Examiner has failed to satisfy the first criterion, i.e., establishing that there is some suggestion or motivation to combine the references above (especially Van Steenkiste et al. or Popoola et al. and Roberts et al.), as required to show a *prima facie* case of obviousness. Furthermore, Applicants assert that the Examiner has also failed to satisfy the third criterion, i.e., establishing that the combination of Van Steenkiste et al. or Popoola et al. with Roberts et al. teaches or suggests all the claim limitations. As indicated above, this third criterion is also required to establish the *prima facie* case of obviousness.

In one form or another, both independent claims 1 and 5 focus on a collimator having a central hole surrounded by a plurality of gas flow holes and a length of from 10 to 30 millimeters with the gas flow holes having a hydraulic diameter of from 0.5 to 5.0 millimeters.

Under the first criterion of the *prima facie* case of obviousness, the case of *In re Sang Su Lee*[3] and *Princeton Biochemicals, Inc. v. Beckman Coulter, Inc.*[4] clarify the law and the Examiner's responsibilities relative to the first criterion.

In re Sang Su Lee clearly defines how suggestion and motivation to modify a reference or to combine reference teachings are determined, and how the knowledge generally available to one skilled in the art is found. The Court of Appeals for the Federal Circuit (CAFC), in *In re Sang Su Lee*, reviewed a decision from the Board of Patent

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of nonobviousness. See MPEP 2142.
[2] *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q. 2d 1438 (Fed. Cir. 1991).
[3] 277 F.3d 1338 (Fed. Cir. 2002).
[4] 411 F.3d 1332 (Fed. Cir. 2005).

Appeals and Interferences of the United States Patent and Trademark Office. The Examiner and the Board agreed that Sang Su Lee's invention "would have been obvious to one of ordinary skill in the art since the demonstration mode is just a programmable feature which can be used in many different device[s] for providing automatic introduction by adding the proper programming software," and that "another motivation would be that the automatic demonstration mode is user friendly and it functions as a tutorial." *Id.* at 1341. However, the CAFC made it abundantly clear that the Board's and the Examiner's conclusory statements did not adequately address the issue of motivation to modify a reference or motivation to combine references. The factual question of motivation is material to patentability, and could not be resolved on subjective belief and unknown authority. *Id.* at 1343. It is improper, in determining whether a person of ordinary skill would have been led to this combination of references, simply to "[use] that which the inventor taught against its teacher." *W.L. Gore v. Garlock, Inc.*, 721 F.2d 1540, 1553 (Fed. Cir. 1983). The Court in *In re Sang Su Lee* went on to state that the "common knowledge and common sense" on which the Board relied in rejecting Lee's application are not the specialized knowledge and expertise contemplated by the Administrative Procedure Act. Conclusory statements such as those provided here do not fulfill the agency's obligation. *In re Sang Su Lee,* 277 F.3d at 1342.

The more applicable and recent case, *Princeton*, is discussed immediately below. In June of 2005, the CAFC reiterated the principles involved in assessing the differences between the prior art and the claimed invention when addressing the first criterion...in the subject application, the motivation to combine Van Steenkiste et al. or Popoola et al. and Roberts et al. See *Princeton.* In *Princeton*, citing *Ruiz v. A.B. Chance Co.*, 357 F.3d 1270, 1275 (Fed. Cir. 2004), the CAFC emphasized that a rejection under 35 U.S.C. §103 specifically requires consideration of the claimed invention "as a whole." Relating to this "as a whole" issue, the CAFC went further to emphasize that

> [i]nventions typically are new combinations of existing principles or features. *Envtl. Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 698 (Fed. Cir. 1983) (noting that "virtually all [inventions] are combinations of old elements"). The "as a whole" instruction in title 35 prevents evaluation of the invention part by part. *Ruiz*, 357 F.3d at 1275. Without this important requirement, an obviousness assessment might

> successfully break an invention into its component parts, then find a prior art reference corresponding to each component. *Id.* This line of reasoning would import hindsight into the obviousness determination by using the invention as a roadmap to find its prior art components. Further, this improper method would discount the value of combining various existing features or principles in a new way to achieve a new result – *often the essence of the invention*. *Id.*
>
> Contrary to this reasoning, section 103 requires assessment of the invention as a whole. *Id.* This "as a whole" assessment of the invention requires a showing that an artisan of ordinary skill in the art at the time of the invention, confronted by the same problems as the invention and *with no knowledge of the claimed invention*, would have selected the various elements from the prior art and combined them in the claimed manner. *Id.* In other words, section 103 requires some suggestion or motivation, *before the invention itself*, to make the new combination. (emphasis added).

In summary of *In re Sang Su Lee* and *Princeton*, the teaching or suggestion to make the combination must be found in the prior art. As such, the teaching or suggestion to combine reference teachings cannot be based on Applicants' own disclosure. Finally, the Examiner must explain the reasons why one of ordinary skill in the art would have been motivated to combine them to render the claimed invention obvious.

In relation to the pending claims, the Examiner correctly recognizes that both Van Steenkiste et al. and Popoola et al. DO NOT disclose, teach, or otherwise suggest a collimator having a length of from 10 to 30 millimeters and also gas flow holes having a hydraulic diameter of from 0.5 to 5.0 millimeters. Then, to supplement this deficiency associated with both Van Steenkiste et al. and Popoola et al., the Examiner relies, in error, on Roberts et al. Simply stated, there is no suggestion or motivation to combine Van Steenkiste et al. or Popoola et al. with Roberts et al.

There is nothing disclosed or taught in Van Steenkiste et al. indicating that it is possible or even desirable to modify the length of its 'flow straightener' 40 and there is nothing disclosed or taught in Popoola et al. indicating that it is possible or even desirable to modify the length of its 'diaphragm' 26. More specifically, Van Steenkiste et al., which utilizes a gas collimator of the prior art as discussed in the present invention, merely refers to the gas collimator as flow straightener 40. The Board is directed to

column 3, lines 35-40 and column 3, lines 50-52. There is no discussion, suggestion, teaching or motivation in Van Steenkiste et al. for considering its gas collimator 40 let alone its length to be a result effective variable on the deposition efficiency of the kinetic spray system as was discovered by the present inventors. Similarly, Popoola et al. is similarly silent as to any effect of its diaphragm 26 on the deposition efficiency of a kinetic spray system.

As for Roberts et al., this reference does not disclose, teach, or even suggest combination of its collimated flow control device, or even its selected length, with a kinetic spray nozzle. Although the Examiner generally references column 1, lines 22+ of Roberts et al., the Examiner provides no convincing evidence why it is in the prior art to combine the collimator of Roberts et al. with a kinetic spray nozzle. Given that there is no discussion in Van Steenkiste et al. and in Popoola et al. of the gas collimators utilized and there is no discussion in Roberts et al. of kinetic spray systems, it is unclear how the Examiner can imagine that the present invention which has been shown to provide a significant enhancement in the deposition efficiency of a kinetic spray system would be obvious based on the references alone or in combination.

Granted, one must also consider knowledge that is generally available to one of ordinary skill in the art when determining whether it is appropriate to combine the teachings of two different references. However, as discussed at length above, when doing so, i.e., when considering the knowledge that is generally available to one of ordinary skill in the art, the teaching or suggestion to make the claimed combination must both be found in the prior art, i.e., in the knowledge of those skilled in the art, and not based on Applicants' disclosure. Once again, obviousness may not be established by hindsight. *Kahn v. General Motors Corp.*, 45 USPQ2d 1608 (Fed. Cir. 1998). Determination of obviousness cannot be based on the hindsight combination of components selectively culled from the prior art to fit the parameters of the invention. *In re ATD Corp v. Lydal, Inc.*, 48 USPQ2d 1321, 1329 (Fed.Cir. 1998).

To rely on the combination invention claimed in the subject application and then sift through the prior art looking for the invention claimed in the subject application is

impermissible hindsight as discussed above and the Examiner cannot engage is such conduct.[5]

For the Examiner to reach a proper determination under 35 U.S.C. §103, the Examiner must follow the guidelines of MPEP 2142:

> The examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. In view of all factual information, the examiner must then make a determination whether the claimed invention "as a whole" would have been obvious at that time to that person. Knowledge of applicant's disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences," conduct the search and evaluate the "subject matter as a whole" of the invention. The tendency to resort to "hindsight" based upon applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

Importantly, Applicants are arguing that it is the claimed combination of the particular length of the collimator and the particular hydraulic diameter of the gas flow holes that is nonobvious and, therefore, patentable. In view of the above information outlining the claimed combination and also the Examiner's responsibilities relative to making combinations of prior art, it is apparent that there is no suggestion or motivation in the prior art to combine the references as the Examiner is combining them, specifically Van Steenkiste et al. or Popoola et al. with Roberts et al.

As indicated above, Applicants assert that the Examiner has also failed to satisfy that the combination of Van Steenkiste et al. or Popoola et al. with Roberts et al. teaches or suggests all the claim limitations. It is established that neither Van Steenkiste et al. nor Popoola et al. disclose, teach, or suggest the diameter of the gas flow holes as particularly claimed. Relative to Roberts et al., the Examiner contends

[5] The courts have also indicated that it is impermissible to use the inventor's disclosure as a road map for *selecting* and combining prior art disclosures.

that this reference discloses a collimator having flow holes with a hydraulic diameter of 0.5 mm. *This is not the case*. In Roberts et al., *every occurrence* of the cross section dimension of its flow passages is *under* approximately 500 microns (which equals 0.5 mm). If Roberts et al. clearly indicates that this diameter is *under* 0.5 mm, Roberts et al. CANNOT possibly disclose the 0.5 to 5.0 mm as claimed in independent claims 1 and 5. The third criterion (teaching or suggestion of all claim limitations) is, therefore, not satisfied and the requisite *prima facie* case is not established.

B. Claims 1-3 and 5-10

Claims 1-3 and 5-10 also stand rejected under 35 U.S.C. §103(a) as being unpatentable over Van Steenkiste et al. (U.S. Patent No. 6,139,913) or Popoola et al. (U.S. Patent No. 6,464,933).

In making this particular rejection, where the Examiner seems to simply modify (without combining) Van Steenkiste et al. or Popoola et al, the Examiner concludes that "it would have been an obvious matter of design choice to a person of ordinary skill in the art to configure the device of Van Steenkiste et al. or Popoola et al. with gas flow holes" of a certain length. The Examiner, in his own statements, indicates that the reason this would have been an obvious matter of design choice is "because [the] Applicant has not disclosed that to have the gas flow holes of 10-25 millimeters length....provides an advantage, is used for a particular purpose, or solves a stated problem." This is not an appropriate standard for an Examiner to modify a single reference and base a §103(a) rejection on. That is, an Examiner cannot conclude that an invention as claimed is obvious because an Applicant has not disclosed that a certain claimed feature provides an advantage, is used for a particular purpose, or solves a stated problem.

Instead, as already outlined above, the law and MPEP clearly require that for an Examiner to appropriately modify a single reference, there must be some suggestion or motivation in the prior art references themselves or in the knowledge generally available to one of ordinary skill in the art. The Examiner cannot use as a basis for making a §103(a) rejection what an Applicant does not disclose.

Aside from this error in the Examiner's analysis, in the original specification (see Paragraphs [0002]-[0006]), Applicants outlined the deficiencies in the prior art kinetic spray systems and explained that the length of the collimator as claimed herein provides an advantage, is used for a particular purpose, or solves a stated problem.

To reiterate, paragraph [0025] of the present specification describes that in the prior art kinetic spray systems the collimator 40 is a disc having a thickness of approximately 1 mm. It is also noted in paragraph [0030] that a similar gas collimator has been utilized in the past in low pressure kinetic spray systems. In contrast, the gas collimator of the present invention is disclosed in paragraph [0030] and Figures 4, 5, and 8B of the present specification. As noted, the present invention lies in significantly lengthening the gas collimator to a length of from 10-30 mm and more preferably from 25-30 mm, a 10-30 fold increase over the length disclosed in the prior art.

The Board is directed to paragraphs [0003] through [0005] of the present specification wherein it discloses the numerous problems with the prior art systems incorporating gas collimators that are very thin 1 mm discs. The problems are low deposition efficiencies that cannot be alleviated by raising the main gas temperature without leading to clogging issues, asymmetric assimilation of particles into the gas stream, and/or turbulence within the gas stream which reduces the deposition efficiency of the system. All of these problems are addressed by the present invention. As for the advantages of the present invention the Board is directed to Figure 7, Figure 9A, and Figure 9B. In addition, the Board is directed to paragraphs [0035] through [0038] wherein these figures are discussed. A careful review of the data disclosed in these figures makes it clear that the present invention provides significant advantages over the prior art gas collimator that are related to the specifics that are claimed in independent claims 1 and 5.

Referring to Figure 7 and paragraph [0035], the results disclosed in Figure 7 were obtained using a constant main gas temperature of 800°F, particles of aluminum-zinc-silicon having a particle size range of from 53-106 microns, a constant traverse speed of 2 inches per second, and a constant main gas pressure of 300 pounds per square inch. Reference line 100 in Figure 7 shows the results utilizing a prior art high

pressure system wherein the collimator is a thin disc of approximately 1 mm in thickness. As expected, the results show that as the powder feed rate of the system is increased the loading onto a substrate surface is increased. An example of the nozzle utilized for generating these results is shown in Figure 2. Reference line 104 shows the results that are obtained using a prior art low pressure system as disclosed in Figure 3. This is a low pressure system and as expected the mass loading obtained utilizing the prior art low pressure system at a given feed rate is lower than that of the prior art high pressure system as one would expect. In both cases the amount of loading increases as the powder feed rate is increased.

What was unexpected is what is disclosed in reference line 102. This represents a gas collimator designed in accordance with the present invention in a low pressure system wherein the collimator has a length of from 10-30 mm, the collimator utilized in this figure had a length of approximately 25 mm, and the gas flow holes had a hydraulic diameter of from 0.5 to 5 mm. It can be seen that at all powder feed rates the present invention gas collimator provided a significant increase in the mass loading onto a substrate obtainable by a given powder feed rate. The Board can see by a comparison between reference lines 104 and 102 that the present invention provides a significant and unexpected advantage.

The Board is directed to Figures 9A and 9B and paragraphs [0036] through [0038]. All of the data disclosed in both figures was generated utilizing a powder that was an alloy of aluminum-zinc-silicon, sprayed onto aluminum substrate, the powder feed rates were kept constant, the particle size range was from 53 to 106 microns, the gas pressure was 300 pounds per square inch, the powder feed pressure was 350 pounds per square inch and the results disclosed in the figures are the average of twelve runs for each condition. The systems were high pressure systems.

Figure 9A shows the loading onto a substrate of two examples of the present invention versus a prior art system. Bar 118 represents the results obtained utilizing a gas collimator designed in accordance with the present invention wherein the length was approximately 20 mm and the gas flow holes had a hydraulic diameter of from 0.5 to 5 mm. The results were obtained using a main gas temperature of 700°F and a traverse speed of 4 inches per second. It can be seen that the results are close to 140

grams per square meter of loading utilizing these conditions. This is in comparison to reference bar 122 which represents the prior art system wherein the gas collimator as disclosed has a thickness of approximately 1 mm. The results shown in bar 122 were obtained after raising the main gas temperature to 800°F and lowering the traverse speed to 3 inches per second. Based on knowledge of the prior art it would be expected that increasing the main gas temperature and reducing the traverse speed should lead to a higher loading of the substrate. Surprisingly, the results are completely unexpected in that the loading was significantly reduced compared to bar 118 utilizing the gas collimator of the present invention. In addition, even when the traverse speed is increased from 4 inches per second to 5 inches per second as shown in bar 120 the present invention still results in a significant increase in the loading on the substrate compared to the prior art shown in bar 122.

The Board is now directed to Figure 9B which shows the deposition efficiency of the present invention versus the prior art. Bar 124 is the deposition efficiency of a system identical to that disclosed in bar 118 above, namely a main gas temperature of 700°F and a traverse speed of 4 inches per second. You can see that the deposition efficiency is close to 50% under these conditions. Bar 126 represents a system identical to that disclosed in bar 120 in Figure 9A. In the system, the main gas temperature was 700°F and the traverse speed was 5 inches per second. Finally, it can be seen that the deposition efficiency of the prior art system shown in bar 128 is less than half that disclosed in either of the prior present invention systems even though the main gas temperature has been increased to 800°F and the traverse speed has been reduced to 4 inches per second.

In summary, the data disclosed and discussed in the present specification makes it clear that the gas collimator designed in accordance with the present invention produces unexpected and significant advantages compared to that found in the prior art. It solves a significant problem in that it enables an operator to utilize a lower main gas temperature while getting highly enhanced deposition efficiencies even at higher traverse speeds. The significance of the advantage provided by the gas collimator of the present invention cannot be over emphasized.

In view of the remarks set forth above, it is respectfully submitted that no

prima facie case of obviousness can reasonably be established by the Examiner. As such, it is respectfully submitted that the Examiner's §103(a) rejections relying on Van Steenkiste et al. or Popoola et al., either alone or in combination with Roberts et al., are improper and should be withdrawn.

C. Claim 4

Claim 4 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Van Steenkiste et al. (U.S. Patent No. 6,139,913) or Popoola et al. (U.S. Patent No. 6,464,933) or in view of Roberts et al. (U.S. Patent No. 3,645,298) and further in view of Mochida et al. (U.S. Patent No. 4,740,408). The rejection to dependent claim 4 relies on the combination of Van Steenkiste et al. or Popoola et al. with Mochida et al. This combination does not comport with the mandates of the MPEP for establishing a *prima facie* case of obviousness and is based on hindsight in view of Applicant's disclosure.

Claim 4 is dependent on claim 1 and adds that the gas flow holes have a hexagonal shape. As discussed above Van Steenkiste et al. and Popoola et al. taken alone or in combination with Roberts et al. do not make independent claim 1 obvious. Claim 4 depends from independent claim 1. The Examiner further relies on Mochida et al. for disclosing gas flow holes having a hexagonal shape. The Examiner suggests that based on Mochida et al. changing the shape of the holes would provide an effective gas flow device. Mochida et al. is directed toward a ceramic honeycomb body suitable for carrying catalizers to purify exhaust gas from internal combustion engines as disclosed in column 1, lines 1-10 of Mochida et al. It is not clear how the Examiner could imagine that one of ordinary skill in the art would be motivated to combine any of the shapes for the gas flow holes for the catalytic converters disclosed in Mochida et al. with the gas collimators disclosed in either Van Steenkiste et al. or Popoola et al. Because dependent claim 4 includes limitations not found in nor made obvious based on the cited references the rejection of claim 4 under 35 U.S.C. §103(a) based on the cited references is improper and should be withdrawn.

D. Claims 11-16

Claims 11-16 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Van Steenkiste et al. (U.S. Patent No. 6,139,913) or Popoola et al. (U.S. Patent No. 6,464,933) or in view of Roberts et al. (U.S. Patent No. 3,645,298) and further in view of Belashchenko (U.S. Patent No. 5,932,293). The rejection to claims 11-16 relies on the combination of Van Steenkiste et al. or Popoola et al. with Belashchenko. This combination does not comport with the mandates of the MPEP for establishing a *prima facie* case of obviousness.

Dependent claim 11 adds that an injector tube extends through the throat of the nozzle into the diverging region of the nozzle. Dependent claims 12-16 depend from claim 11. Belashchencko et al. is directed toward a thermal spray system and not a kinetic spray system as is the present invention. Applicants assume that the Examiner's reference in the Final Office Action to an injector tube 68 extending into a throat refers to Figure 7 of Belashchencko et al. A review of Figure 7 and the accompanying descriptive text of Belashchencko et al. reveal that there is no throat disclosed in the thermal spray system of Belashchencko et al. In addition, the injector 68a shown in Belashchencko et al. ends before the end of the converging section of the nozzle and does not extend through a throat as suggested by the Examiner and as required by dependent claim 11.

Even when combined with Van Steenkiste et al. and Popoola et al., Belashchencko provides no motivation for modifying the disclosures of Van Steenkiste et al. and Popoola et al. to extend the powder injector tube through the throat of the supersonic nozzle and into the diverging section of the nozzle as required by claims 11-16. As disclosed in the present specification in paragraph [0033] the present inventors surprisingly found that extending the injector tube 50 in the low pressure nozzle system a distance beyond the end of the throat up to 1/3 of the length of the diverging section resulted in an increase in the deposition efficiency of the kinetic spray nozzle, which was unexpected. Such a result is not obvious given the disclosures of the cited references. In summary, dependent claim 11 includes limitations neither found in nor made obvious in view of the cited references taken alone or in combination, thus the rejection of dependent claim 11 and dependent

claims 12-16, which depend from dependent claim 11, based on the cited references is improper and must be withdrawn.

E. Summary

The Examiner has failed to establish a *prima facie* case of obviousness by failing to disclose, teach, or suggest all of the claimed limitations or by failing to show a teaching, suggestion, or motivation to combine the references as suggested by the Examiner. Accordingly, the Board is respectfully requested to reverse the rejection of the claims as not fairly based upon the teachings of the references.

Respectfully submitted,

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October 19, 2006
Date

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(8) Claims Appendix

1. (Original) A gas collimator for a kinetic spray nozzle comprising:

a collimator having a central hole surrounded by a plurality of gas flow holes and a length of from 10 to 30 millimeters; said gas flow holes having a hydraulic diameter of from 0.5 to 5.0 millimeters.

2. (Original) The gas collimator as recited in claim 1 wherein the ratio of said hydraulic diameter to said length is from 1:5 to 1:50.

3. (Original) The gas collimator as recited in claim 1 wherein said length of said collimator is from 25 to 30 millimeters.

4. (Original) The gas collimator as recited in claim 1 wherein said gas flow holes have a hexagonal shape.

5. (Original) A kinetic spray nozzle comprising:

a supersonic nozzle having a gas collimator located between a premix chamber and a mixing chamber; said mixing chamber located adjacent to a converging section of said nozzle; a throat located between said converging section and a diverging section of said nozzle; said collimator having a central hole surrounded by a plurality of gas flow holes and a length of from 10 to 30 millimeters; said gas flow holes having a hydraulic diameter of from 0.5 to 5.0 millimeters.

6. (Original) The kinetic spray nozzle as recited in claim 5 wherein the ratio of said hydraulic diameter to said length is from 1:5 to 1:50.

7. (Original) The kinetic spray nozzle as recited in claim 5 wherein said length of said collimator is from 25 to 30 millimeters.

8. (Original) The kinetic spray nozzle as recited in claim 5 wherein said gas

flow holes have one of a hexagonal shape or a circular shape.

9. (Original) The kinetic spray nozzle as recited in claim 5 wherein the ratio of a total open area of a cross-section of said collimator to a cross-sectional open area of said mixing chamber is from 0.5:1 to 0.9:1.

10. (Original) The kinetic spray nozzle as recited in claim 5 further including an injector tube received in said central hole and extending through said collimator.

11. (Original) The kinetic spray nozzle as recited in claim 10 wherein said injector tube extends through said throat into said diverging section of said nozzle.

12. (Original) The kinetic spray nozzle as recited in a claim 11 wherein said injector tube extends up to one third of a length of said diverging section past said throat.

13. (Original) The kinetic spray nozzle as recited in a claim 11 wherein said injector tube extends from 2 to 50 millimeters past said throat.

14. (Original) The kinetic spray nozzle as recited in a claim 11 wherein said injector tube extends from 5 to 30 millimeters past said throat.

15. (Original) The kinetic spray nozzle as recited in claim 11 wherein a gap between said injector tube and an inside of said throat permits an air flow of from 15 to 50 cubic feet per minute through said gap.

16. (Original) The kinetic spray nozzle as recited in claim 11 wherein a gap between said injector tube and an inside of said throat permits an air flow of from 25 to 35 cubic feet per minute through said gap.

17. (Withdrawn) A method of applying a material via a kinetic spray process comprising:

a) providing a particle powder;

b) providing a converging diverging supersonic nozzle having a gas collimator having a central hole surrounded by a plurality of gas flow holes and a length of from 10 to 30 millimeters; the gas flow holes having a hydraulic diameter of from 0.5 to 5.0 millimeters;

c) directing a flow of a gas through the collimator and the nozzle, the gas having a temperature insufficient to cause melting of the particles in the nozzle; and

d) entraining the particles in the flow of the gas and accelerating the particles to a velocity sufficient to cause the particles to adhere to a substrate positioned opposite the nozzle.

18. (Withdrawn) The method as recited in claim 17 wherein step b) further comprises providing a collimator where the ratio of the hydraulic diameter to the length is from 1:5 to 1:50.

19. (Withdrawn) The method as recited in claim 17 wherein step b) further comprises providing a collimator where the length of the collimator is from 25 to 30 millimeters.

20. (Withdrawn) The method as recited in claim 17 wherein step b) further comprises providing a collimator having one of a hexagonal or a circular shaped gas flow holes.

(9) Evidence Appendix

NONE

(10) Related Proceedings Appendix

NONE

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